

**METHOD AND APPARATUS FOR RECONSTRUCTING A  
SURFACE USING A BALL-PIVOTING ALGORITHM**

**Abstract of the Disclosure**

5                   A method and apparatus are disclosed for finding a triangle mesh that  
interpolates a set of points obtained from a scanning system. A ball-pivoting algorithm  
computes a triangle mesh interpolating a given point cloud. The disclosed ball-pivoting  
algorithm triangulates a set of points by “rolling” a ball of radius  $\rho$  on the point cloud.  
The points are surface samples acquired with multiple range scans of an object. The  
10   ball-pivoting algorithm starts with a seed triangle, and pivots the ball of a given radius,  $\rho$ ,  
around an edge of the triangle. During the pivoting operation, the ball revolves around  
the edge while keeping in contact with the edge's endpoints. The ball pivots until it  
touches another scan point, forming another triangle. The ball-pivoting operation  
continues until all reachable edges have been tried, and then starts from another seed  
15   triangle, until all scan points have been considered. The ball-pivoting algorithm is related  
to alpha-shapes, and given sufficiently dense sampling, it reconstructs a surface  
homeomorphic to and within a bounded distance from the original manifold.

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